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HEINEMANN
SERIES JA CIRCUIT BREAKERS

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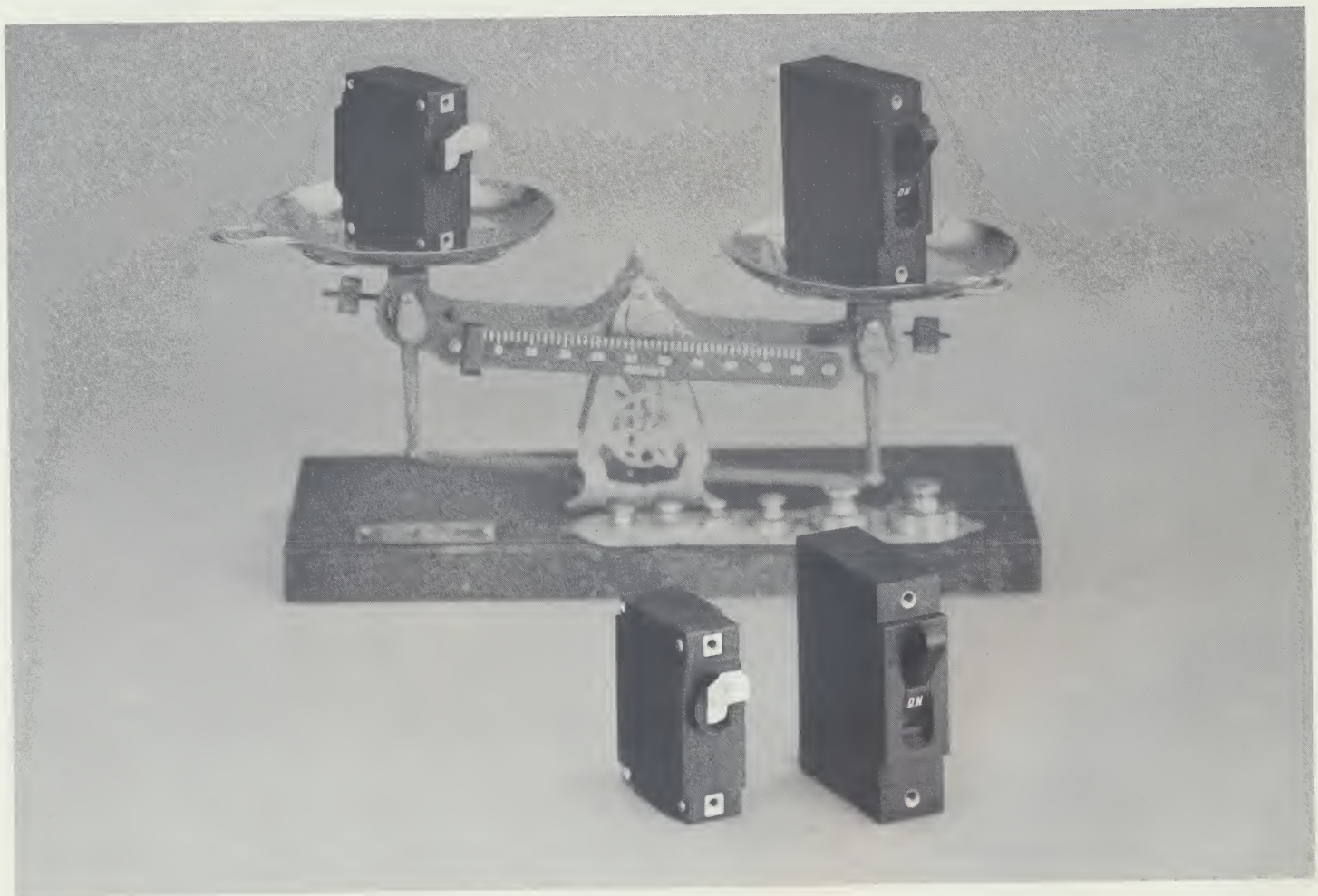
A new line of moderate-cost hydraulic-magnetic breakers for the OEM

Heinemann's new Series JA circuit breaker is in many respects an evolutionary development of the Series AM12 breaker, for years the most popular OEM model in the Heinemann line. The JA has similar qualities of ruggedness and durability, but is smaller, lighter, and lower priced. It is easier to install and connect, and its exclusive color-cap option offers the designer the opportunity to enhance equipment appearance and improve operational intelligibility (see page 5).

Because of its smaller size and lower cost, the JA will undoubtedly recommend itself to AM12 users whose requirements fall within the JA's range of 0.100 to 30 amperes. Aside from slightly different time-delay characteristics, the JA is electrically interchangeable with the AM12. It can be supplied with the same options, such as special-function internal circuits, and is designed to meet similar rigorous environmental specifications. The JA is available in single-, two-, and three-pole models for 60 or 400 Hz AC, or for DC operation. A number of UL-listed models are available.

The breaker's compactness makes it particularly well-suited for use where equipment size must be kept as small as possible, whether for reasons of sales appeal or functional necessity. Its light weight (2.5 oz., for a single-pole model) is an advantage where portability is a factor or where total weight is a critical consideration, as in aircraft and airborne equipment applications. The breaker's match-box size is also advantageous where it is desirable to have a large number of circuits centrally controlled from a small, consolidated panel. (JA breakers, being magnetically actuated, generate negligible heat under load and may be installed as close together as requirements dictate.)

In addition to the features cited, the



New Series JA breakers (white handles) are one-third smaller in volume and one-third lighter in weight than comparable Series AM12 breakers.

Series JA breaker incorporates all of the many unique capabilities (see following paragraphs) that have made Heinemann circuit breakers pre-eminent in the original equipment field. Though lower priced than comparable Heinemann breakers, it is in every respect a premium component, and is backed by the same five-year guarantee that covers all other Heinemann Electric Company circuit breakers and relays.

Precise current ratings

The current-sensing element of the Heinemann hydraulic-magnetic circuit breaker is a solenoid coil. The wire size and number of turns used to form the coil determine the nominal current-carrying capacity or rating of a given breaker. Since these parameters are readily controlled to fine tolerances on a production basis, breaker ratings (and calibrated trip-points) are uniformly precise and accurate.

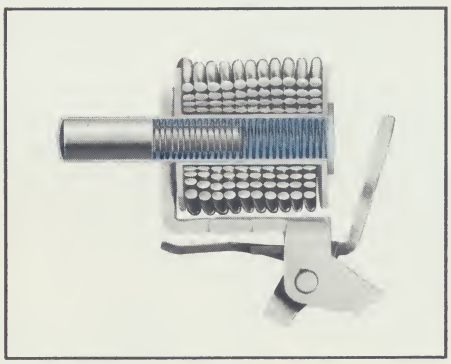
The number of ampere-turns in the solenoid coil can be adjusted to provide any integral or fractional current value desired. It is thus practicable for Heinemann to offer, in addition to standard current ratings, custom ratings to the user's exact specifications. Custom ratings can be as precise as the application demands; you can specify ampere values out to three decimal places, if need be, and you can have a different current rating for each pole of a two- or three-pole breaker. The only limitation is that imposed by the minimum/maximum current range of the breaker model. With the Series JA, you can obtain custom ratings in any integral or fractional current value between 0.100 and 30 amperes.

Choice of response-time characteristics

The Series JA breaker is available with either time-delay or non-time-delay construction. There are two standard

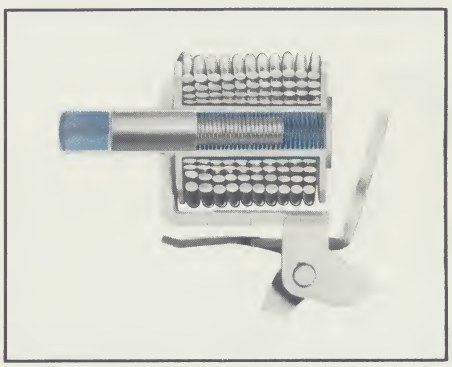
THE HYDRAULIC-MAGNETIC PRINCIPLE

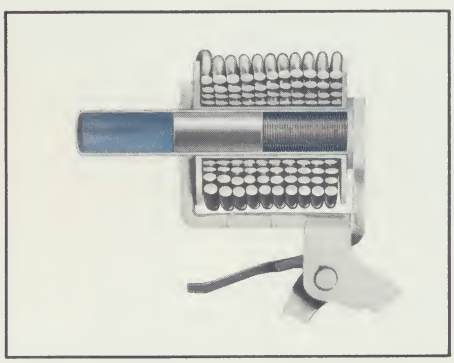
How the Breaker Works



1 The Heinemann hydraulic-magnetic circuit breaker operates on load-current-produced magnetic-flux variations in a solenoid coil. The coil is wound around a hermetically sealed, non-magnetic tube containing a spring-loaded, movable iron core and a silicone liquid fill. With the load current either at or below the breaker's nominal rating, the magnetic flux is of insufficient strength to move the core, and it remains at the end of the tube opposite the armature.

2 On an overload the magnetic flux force increases, pulling the iron core into the coil towards the armature end of the tube. This reduces the reluctance of the magnetic circuit and further increases the strength of the magnetic field. The silicone liquid regulates the core's speed of travel, creating a controlled time delay that is inversely proportional to the magnitude of overload. (In non-time-delay breakers this intentional delay function is omitted.)





3 When the magnetic flux reaches a predetermined value, the armature is attracted to the pole piece and the breaker trips. (The breaker may trip before the core reaches the pole piece if the critical flux value is reached first.) On very heavy overloads or short circuits, the flux produced by the coil alone, irrespective of core position, is sufficient to pull in the armature. The time delay is bypassed, with the result that circuit interruption is instantaneous—a highly desirable response characteristic.

time-delay curves each for 60 Hz, 400 Hz, and DC. (Curves are shown on pages 8 and 9.) The choice of response-time options permits selection of breaker tripping characteristics that will correlate closely with the inrush overcurrent requirements of the protected equipment or components.

In time-delay breakers, the delay period is inversely proportional to the magnitude of overload: the larger the overload, the shorter the delay, and vice versa. At overcurrent values of 800 percent breaker rating and above, the time-delay function is bypassed and tripping occurs instantaneously. The breaker thus provides fast, immediate response where it's needed most—in the critical area of heavy fault currents and short circuits. The inverse time delay, properly selected and applied, effectively prevents unnecessary power interruption on safely tolerable current surges, without compromising protection in any way.

Non-time delay breakers are designed to provide instantaneous (i.e., not intentionally delayed) response at overcurrent values of 120% of load for 60 Hz and DC models, and 130% of load for 400 Hz models. This type of breaker is used when overloads of any appreciable magnitude or duration cannot be tolerated. See pages 8 and 9.

Temperature-stable performance

In marked contrast to thermal-type protection devices, the hydraulic-magnetic Series JA circuit breaker is not adversely affected by ambient temperature excursions above or below the standard calibration temperature of 77°F. The breaker will carry 100 percent rated load at any ambient within its over-all operating temperature range. Equally important, it will always trip at the specified "must trip" overcurrent values regardless of ambient conditions. Derating is never necessary; performance is never compromised.

The breaker does, however, automatically adjust its time-delay characteristics to temperature variations. This is brought about by viscosity changes in the hydraulic damping fluid that regulates the time-delay response.

The effect is a favorable one. At high ambients the delay period for any given percentage of overload is shortened somewhat; at low ambients it is lengthened. This adjustment is consistent with the performance characteristics of most electrical and electronic components, which generally exhibit less overload tolerance at high temperatures than at normal or low temperatures. The slight prolongation of the breaker's time delay under low-temperature conditions, moreover, is advantageous in any application where a longer inrush period is necessary to accelerate the startup of cold equipment.

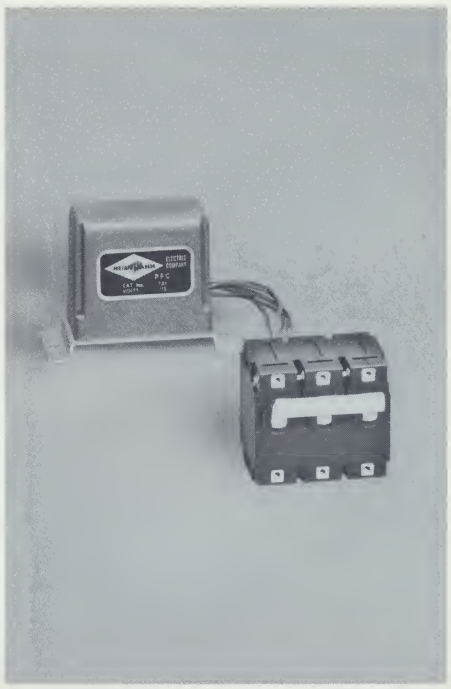
Special-function internal circuits

The modified internal constructions described on page 7, though simple in themselves, enable the Heinemann circuit breaker to perform relatively sophisticated functions well beyond the scope of any other protective device. The applicational possibilities of these special internal circuits are almost endless. Heinemann special-function breakers have been used for diverse protection and control services in everything from an automatic bowling-pin setter to a language-translating computer. In most instances it has been found that a special-function breaker not only provided the simplest solution to a problem, but offered significant over-all economies as well.

Power failure control: Trips breakers on power interruption

Heinemann's PFC™ voltage-loss sensing relay trips an associated breaker instantly in the event of a sudden power outage. Lockout circuitry prevents a restart if the breaker is reset while power is out.

When breakers are furnished with this unique option, the hazards of an unexpected resumption of line voltage are avoided. Personnel are protected from



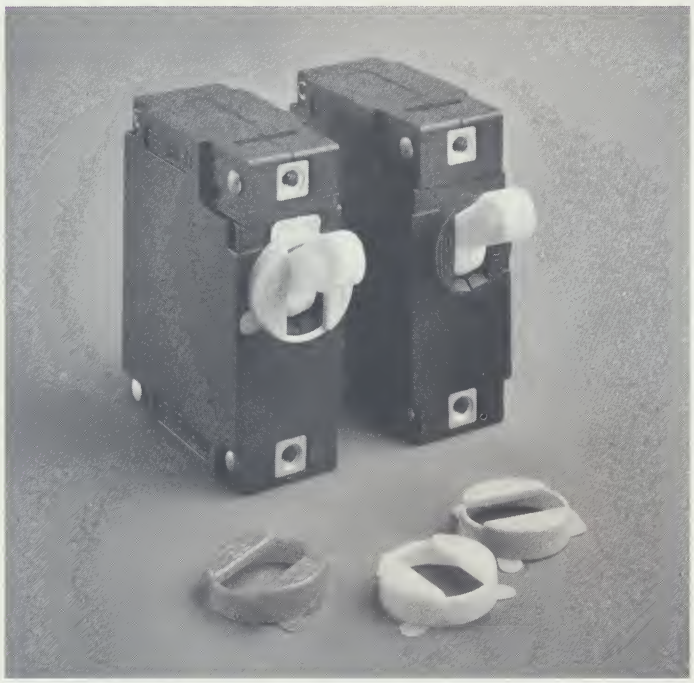
PATENT PENDING

an abrupt startup of dangerous machinery, power lines are spared a heavy inrush that could cause a second outage, and equipment that requires a carefully controlled startup can be returned to operation in an orderly manner. As shown, the power failure control relay is approximately the size of a three-pole JA. One breaker pole has a special relay-trip circuit that trips the breaker on signal from the PFC relay if power is lost. The remaining poles furnish overload protection. For complete information, request Bulletin 550.

IMPORTANT PACKAGING FEATURES

"Instant" Color Coding. Snap-on color caps, a Heinemann innovation in circuit breaker packaging, add much to the attractiveness and utility of the JA breaker, but only pennies to its cost. Available in nine standard Electronic Industries Association colors—black, brown, red, orange, yellow, green, blue, gray, and white—the caps can serve as both decorative panel accents and as a means of color coding breaker-controlled circuits (page 11).

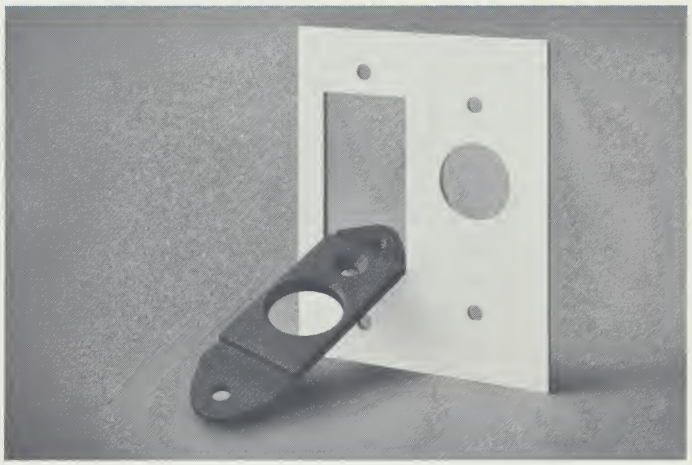
Color-coded breakers are useful for such functions as indicating a circuit switching sequence or segregating normally operative circuits from emergency circuits. Breaker color caps can also be used to good advantage where pilot lights are employed for remote trip indication; the simple expedient of co-ordinating lamp and breaker color-coding will assure immediate identification of the particular breaker(s) involved in



any change of status. (Series JA breakers with auxiliary switches, see page 7, are ideally suited for remote indication and alarming; they permit direct interconnection between breaker and display device without any interposing components.)

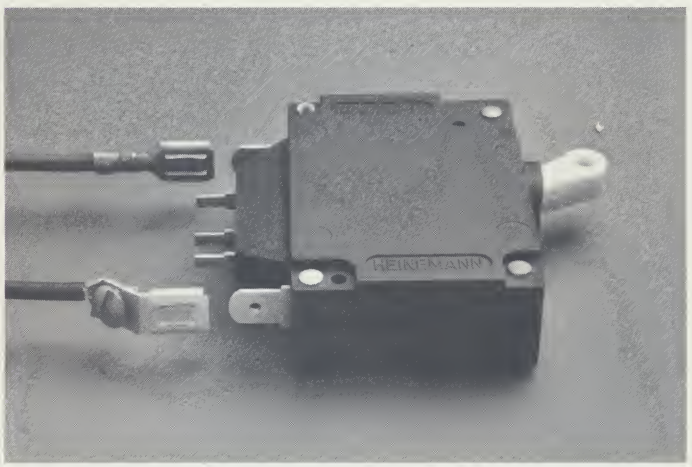
The color caps are quickly and easily installed. The cap is placed over the round breaker boss before the breaker is inserted in the panel cutout; integral tabs secure the cap behind the panel when the breaker mounting screws are tightened.

Another styling note is the white switch handle, which is standard for the JA line. The handle is outward-tapered and smoothly rounded to give a solid "feel." The total handle travel of 55° of arc between ON and OFF positions provides positive indication of operating status whether the breaker is viewed from above, below, or dead-on (Heinemann circuit breakers have no confusing intermediate reset position).

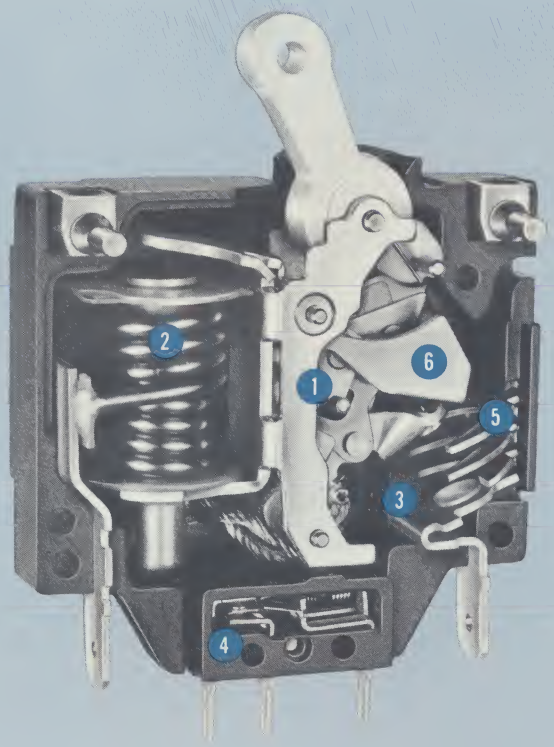


Easy installation. The Series JA breaker is designed for fast, easy panel mounting. The breaker's round boss eliminates the square cuts required for most other breakers, thus requires less production time. Cutout preparation is a simple matter of punching or drilling three common-centerline holes per breaker pole. Existing panels that have been cut to fit the Heinemann AM12 and other dimensionally similar breakers can be readily converted to accept the JA with the adapter plate shown.

"Universal" terminals. The JA breaker can be used with whatever type of wiring termination you are now using. The breaker's main terminals are drilled for soldered connections; with appropriate snap-on adapters they will also accept crimped-type or screw-type connections, as illustrated. The smaller auxiliary-switch terminals will accept either soldered connections or snap-on connectors. All adapting hardware is of standard configuration.



A BREAKER BUILT FOR RELIABLE PERFORMANCE OVER A LONG SERVICE LIFE



1 TRIGGER-ACTION LATCH

Simple yet rugged, the latch incorporates trip-free construction: the breaker cannot be held closed against a fault condition. Multipole models feature true common-trip construction. An internal tripper bar trips the entire breaker if an overload occurs on one or more poles.

2 HYDRAULIC-MAGNETIC ELEMENT

The hydraulic-magnetic current-sensing element provides precise tripping characteristics. It is non-thermal in operation; breaker current-carrying capacity and calibrated trip-points are unaffected by ambient temperature excursions.

3 SELF-CLEANING CONTACTS

The contact arm moves on a sliding pivot point, causing a wiping action every time the contacts are opened or closed. The resultant cleaning action assures low contact resistance and long contact life; these qualities are further enhanced by the use of silver alloy contact material.

4 AUXILIARY SWITCH

Auxiliary switch construction, an optional feature (see opposite), can be used to operate remote indicating or alarm devices. The integrally housed, miniature snap-action switch is rated at up to 5 amps' contact capacity.

5 HIGH-SPEED ARC QUENCHING

Fragmentation plates and a half-turn magnetic blowout are employed to obtain fast arc quenching. The arc is fragmented and attenuated by the grid structure of the plates; the magnetic blowout pulls the arc into an arcing chamber away from the normal contact surfaces.

6 BALANCED ARMATURE

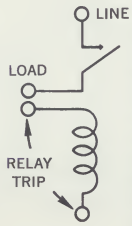
A counterbalance added to the actuating armature serves to prevent mechanical breaker tripping under conditions of shock and vibration. In many respects, the JA's environmental specifications are a match for more expensive Mil-type breakers. See page 10 for details.

SPECIAL-FUNCTION INTERNAL CIRCUITS

The Series JA is available with various special internal circuit constructions that enable it to perform a diversity of unusual protective and/or control functions. Quite often, a special construction can simplify circuitry, thereby improving overall reliability. Though special order items, these modifications are tooled for production and can be supplied at reasonable cost. Generally, the additional cost will be lower than the labor and component costs that would be incurred through an alternate design route. Special internal circuits can be incorporated in both single- and multi-pole breakers. With the latter, a different circuit can be provided on each pole in virtually any arrangement. Special-function breakers are identical to series-trip models, except for a slightly deeper case and additional terminals to accommodate the more complex circuits. See page 11 for catalog information, page 12 for dimension drawings.

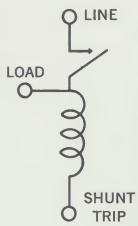
SERIES-TRIP

The standard internal circuit arrangement. Coil and contacts are in series with each other and with the line and load terminals. Overcurrent sensing and circuit interruption take place in the protected circuit. Because of their durable construction, Heinemann series-trip breakers are frequently used as both the equipment power switch and main overload protector.



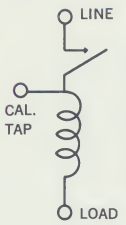
RELAY-TRIP

Provides a separate control circuit which may be actuated from a remote device. Electrical isolation of the relay-trip coil from the line and load terminals permits the use of a different current or voltage from that which is switched through the contact circuit. Relay-trip breakers can be supplied with either voltage-sensing or current-sensing (overload) coils. (See notes.)



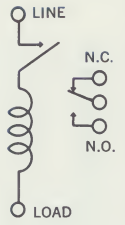
SHUNT-TRIP

Permits remote tripping through appropriate circuit-closing contacts in a remote device. Shunt-trip breakers differ from relay-trip models in that the shunt-trip circuit is designed to utilize the line voltage rather than a different power source. The combined current through the load and shunt-trip terminals must not exceed the breaker's contact rating. (See notes.)



CALIBRATING-TAP

Permits two loads to be controlled by one breaker, with tripping in response to overloads in the main circuit only. An overload in the calibrating-tap-connected circuit will not cause tripping. Breakers rated up to 1 amp may be shunted with a resistor to raise the trip-current rating. The combined load through the coil and the calibrating tap must not exceed the breaker's contact rating. (See notes.)



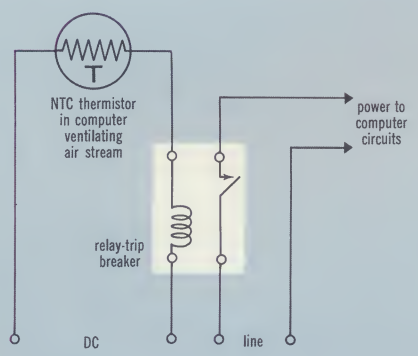
AUXILIARY SWITCH

The auxiliary switch is a miniature snap-action SPDT switch enclosed within the breaker case. Switch is actuated by breaker mechanism but is electrically isolated from the breaker circuit. The NC contacts are open when the breaker is ON, and closed when the breaker is OFF. Contact capacity is 5 amp at 125 or 250 VAC; 5 amp at 30 VDC, resistive; 3 amp at 30 VDC, inductive.

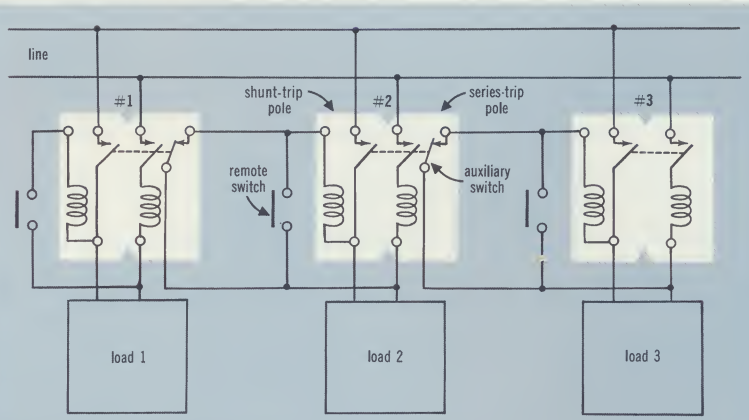
NOTES

1. **Shunt-trip and relay-trip breakers,** like series-trip and calibrating-tap models, can be furnished with or without a time-delay response. Non-time-delay construction is standard, however, and will be supplied unless otherwise specified.
2. **Shunt-trip and relay-trip coils** are designed for non-continuous duty and must be de-energized when the breaker contacts are opened. Within certain limitations, continuous-duty coils can be provided; consult factory for data.
3. **Auxiliary switches** can be furnished only on breakers with series-trip or switch-only internal construction.
4. **When ordering relay-trip** breakers, always specify the coil and contact voltage and current values separately.

ILLUSTRATIVE APPLICATIONS



High-temperature limit control with manual reset. A voltage-sensing relay-trip breaker is used here to protect computer semiconductor circuits from overheating. The relay-trip coil is connected to an NTC thermistor located in the ventilating air stream of the computer. If the temperature of the ventilating air rises above a safe level due to fan failure or other abnormal conditions, the resistance of the thermistor will drop, raising the breaker's coil voltage sufficiently to cause instantaneous tripping. The designer used this circuit because it offered the most economical means of providing high-temperature cutoff with the manual reset necessary to prevent destruction of stored data in the computer memory.



Foolproof circuit for sequential startup and shutdown. The three loads in this circuit can be turned on only in the sequence 1-2-3, and off in the sequence 3-2-1. If a breaker is turned on out of sequence, it will trip immediately. If it is turned off out of sequence, it will cause any breaker(s) to the right of it to trip.

Each two-pole breaker has a series-trip pole with auxiliary switch, and a normally-de-energized shunt-trip pole that trips instantly when energized. Suppose breaker #2 is turned on before breaker #1. It will trip at once because its shunt-trip pole "sees" the line voltage through the closed auxiliary switch on breaker #1. If breaker #1 has been turned on first, however, its auxiliary switch will have opened, permitting breaker #2 to be turned on. Similarly, breaker #2 must be on before #3 can be switched on.

On the other hand, if breaker #2 is turned off out of sequence, its own auxiliary switch closes, tripping breaker #3. The shunt-trip poles can also be actuated from remote switches or alarm contacts. Overload protection is furnished by the three series-trip poles.

TRIPPING SPECIFICATIONS

Time-Delay Trip Range

Breakers (in standard wall-mount position) shall hold 100% rated load.

Breakers may trip between 101% and 125% load; must trip at 125% load and above, as shown on time-delay curve selected.

Non-Time-Delay Trip Ranges

Breakers shall hold 100% rated load.

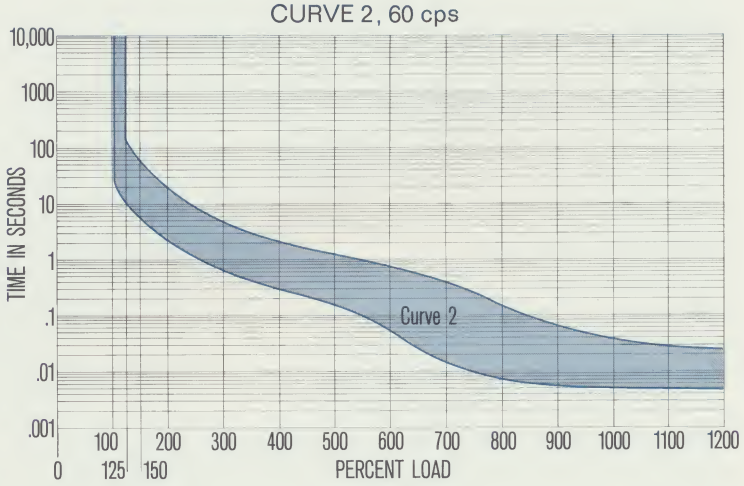
Breakers for 60 cps or DC service may trip between 101% and 120% rated load, must trip at 120% rated load and above.

Breakers for 400 cps service may trip between 101% and 130% rated load, must trip at 130% rated load and above.

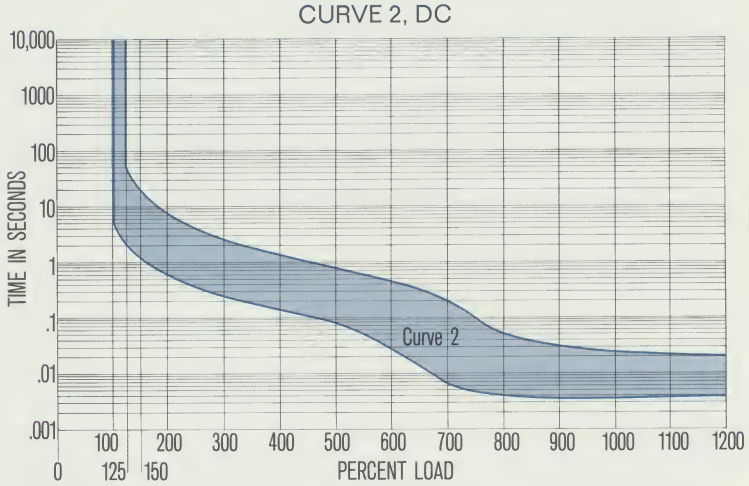
NOTES

The time-delay curves shown describe breaker response with no pre-loading. Curves are plotted at an ambient temperature of 77°F (25°C).

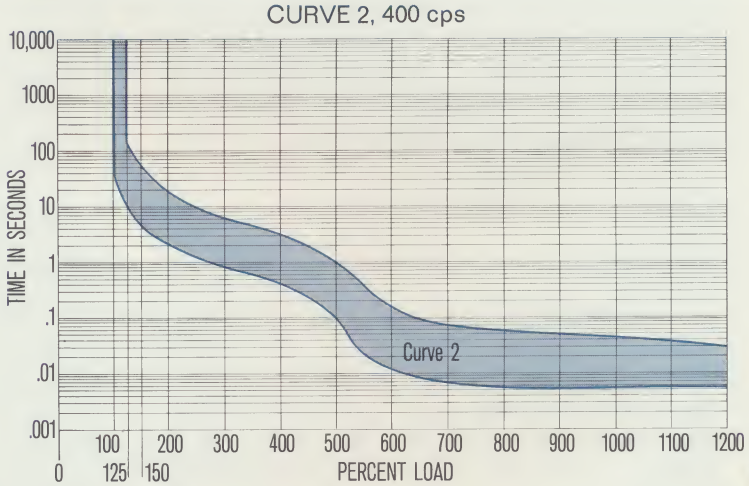
CURVE 2, 60 cps



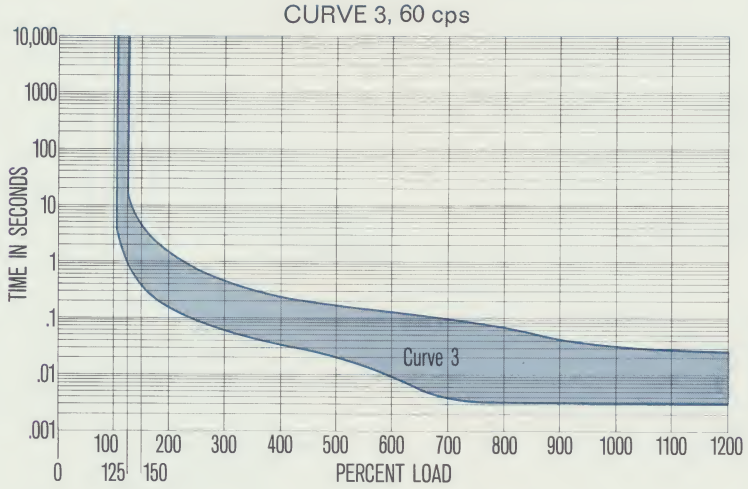
CURVE 2, DC



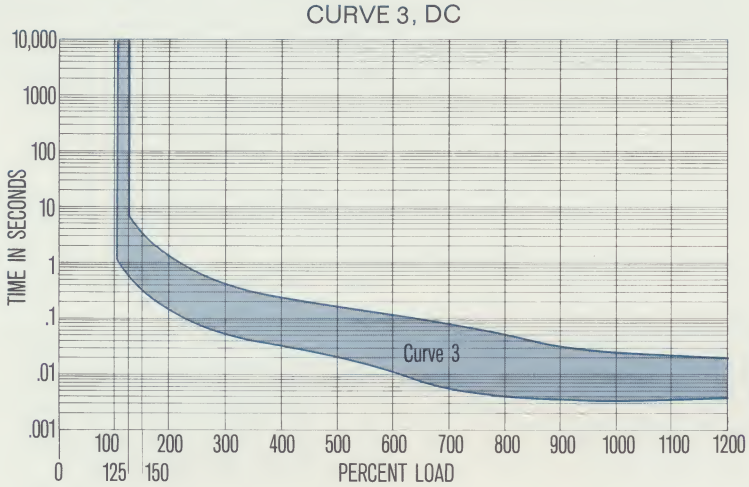
CURVE 2, 400 cps



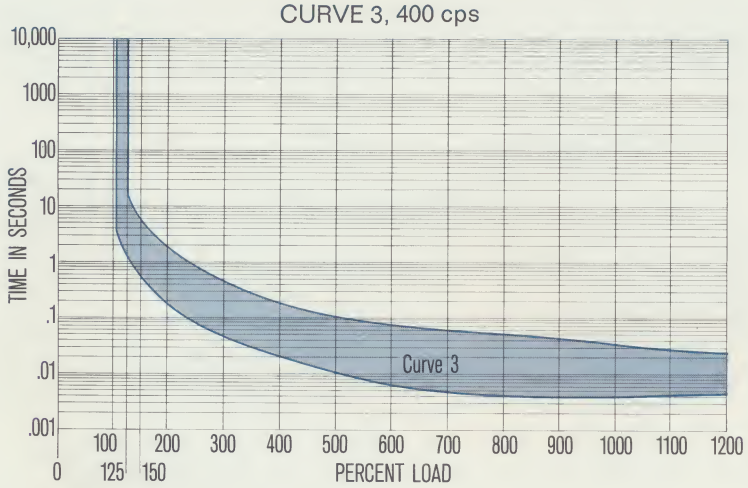
CURVE 3, 60 cps



CURVE 3, DC



CURVE 3, 400 cps



CURVE CHARACTERISTICS AND APPLICATIONS

Curve 2

A general purpose characteristic, this curve is frequently used for mixed circuits where the circuit breaker is rated to the wiring rather than to a specific load.

Curve 3

This curve permits a relatively high flash inrush but only a short time-delay on prolonged overloads. It is typically used to protect transformers, vacuum tubes, and electronic circuits in general.

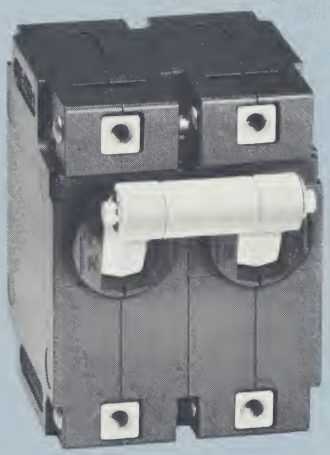
Non-Time-Delay Breakers

Non-time-delay breakers are designed to trip instantaneously in response to overloads of practically any size and duration. Because they have no provision for a deliberate delay, non-time-delay breakers should be used only when it is desirable to furnish an immediate response to all overcurrent surges that exceed the breaker's tripping specifications as shown on page 8.

To order non-time-delay breakers, specify Curve P.

GENERAL SPECIFICATIONS

CATALOG NO. JA1



CATALOG NO. JA2

CATALOG NO. JA3

ELECTRICAL RATINGS

Standard maximum voltages. 250V 60 Hz AC, 250V 400 Hz AC, 65V DC.

Current ratings. Any integral or fractional value from 0.100 to 30 amperes, AC or DC. See table at right for a complete list of current ratings at various voltages.

Interrupting Capacities: See table at right.

UL listings. Single-, two-, and three-pole models are UL-listed for operation to 240V 60 Hz AC. Single- and two-pole models are also UL-listed for operation to 65V DC. See table for current ratings. All UL-listed breakers are series-trip models, with or without auxiliary switches. Switches are UL-listed to 5 amperes at 250V AC. In multipole breakers, mixed AC and DC current and voltage ratings are permitted. All UL-listed breakers have an additional Suffix A in the catalog number: JA2-A2A3-**A**-10-2. UL Re-examination Service Component Listing, File E-39309. This component listing permits the use of JA breakers in combination with Heinemann Series CD/CF breakers in applications such as vending machines, data processing equipment, etc. When properly installed in factory-assembled equipment, JA and CD/CF breakers do not require additional UL examination.

ENVIRONMENTAL DATA

Fungus and moisture resistance is provided by treating all ferrous parts with a special moisture-resistant finish, and by using special springs and inherently fungus-resistant phenolic cases, covers, and handles. Note: In heavily contaminated atmospheres that contain concentrations of dirt, grit, dust, pumice, or corrosive chemicals, JA breakers should be housed in suitable enclosures.

Humidity. Tested in accordance with Mil-Std-202 and Mil-Std-170.

Shock and Vibration. Tested for shock in accordance with Mil-Std-202, Method 202. Tested for vibration in accordance with Mil-Std-202, Method 201: 10 to 55 Hz, 0.06″ total excursion on three mutually perpendicular planes. Vibration tests are conducted with breakers carrying full-rated current. Shock and vibration specifications apply to time-delay breakers only.

Operating temperature. —40°C to +85°C.

Dielectric strength. 1500V, 60 or 400 Hz AC; 1100V DC.

Insulation resistance. 100 megohms at 500V AC.

Endurance. 60 Hz AC breakers are subjected to an endurance test consisting of 10,000 on/off operations: 6000 at rated current and voltage, 4000 at no load.

Approximate weights: JA1: 2.5 oz., JA2: 5 oz., JA3: 7.5 oz.

STANDARD AND UL-LISTED RATINGS

Standard Ratings			UL-Listed Ratings		
Voltage	Current Range, Amps	Interrupting Capacity, Amps	Voltage	Current Range, Amps	Interrupting Capacity, Amps
250V 60 Hz	0.100-30	1000	240V 60 Hz	0.100-25	1000
125V 60 Hz	0.100-30	2000	125V 60 Hz	0.100-25	1000
65V DC	0.100-20	1000	65V DC	0.100-20	1000
50V DC	0.100-25	2000	50V DC	0.100-25	1000
32V DC	0.100-30	2000	32V DC	0.100-30	1000
250V 400 Hz	0.100-30	1000	—	—	—
125V 400 Hz	0.100-30	2000	—	—	—

STOCK BREAKERS, SERIES-TRIP

60 Hz Models: 250V AC, Time-Delay Curve 2

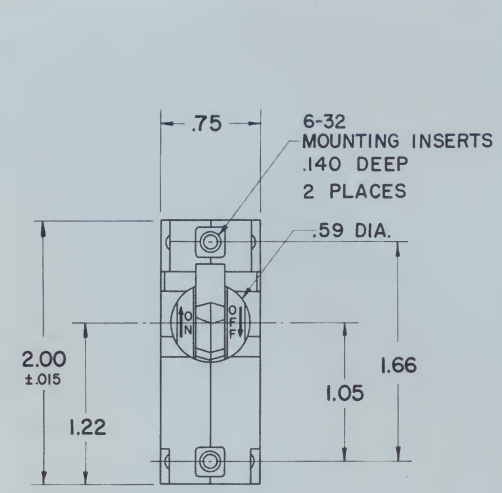
Catalog Number (Replace brackets with desired ampere rating)	Stock Current Rating Amperes	No. Poles	No. Aux. Switches
JA1-A2-A-[ ]-2	0.5, 1, 2, 3, 5, 7, 10, 15, 20	1	1
JA1-A3-A-[ ]-2	0.5, 1, 2, 3, 5, 7, 10, 15, 20	1	—
JA2-A2A3-A-[ ]-2	5, 10, 15, 20	2	1
JA2-A3-A-[ ]-2	5, 10, 15, 20	2	—
JA3-A2A3A3-A-[ ]-2	5, 10, 15	3	1
JA3-A3-A-[ ]-2	5, 10, 15	3	—

DC Models: 65V DC, Time-Delay Curve 2

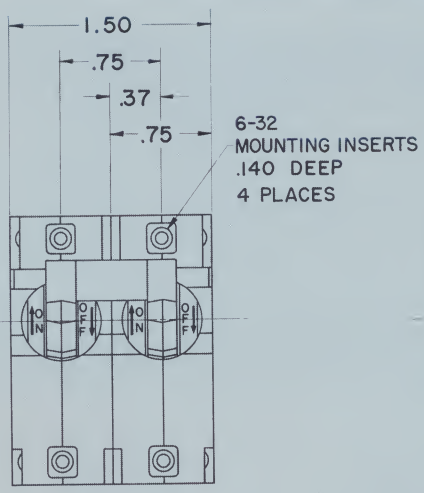
JA1-B2-A-[ ]-2	1, 2, 3, 5, 15, 20	1	1
JA1-B3-A-[ ]-2	1, 2, 3, 5, 7, 10, 15, 20	1	—
JA2-B2B3-A-[ ]-2	5, 15	2	1
JA2-B3-A-[ ]-2	5, 15	2	—

400 Hz Models: 250V AC, Time-Delay Curve 2

JA1-C2-[ ]-2	2, 5, 10, 15, 20	1	1
JA1-C3-[ ]-2	2, 5, 10, 15, 20	1	—
JA2-C2C3-[ ]-2	5, 15	2	1
JA2-C3-[ ]-2	5, 15	2	—
JA3-C2C3C3-[ ]-2	5, 15	3	1
JA3-C3-[ ]-2	5, 15, 20	3	—



Cat. No. JA1



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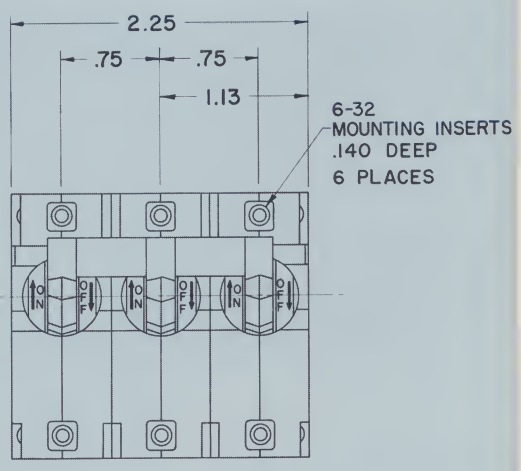
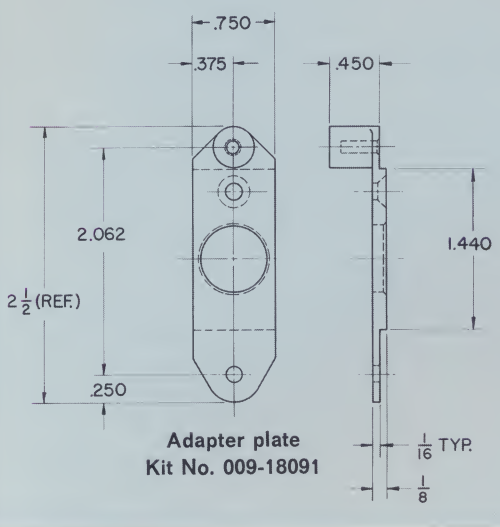
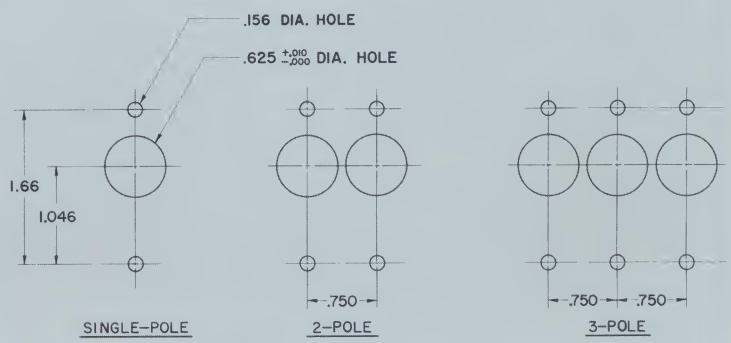


Cat. No. JA3



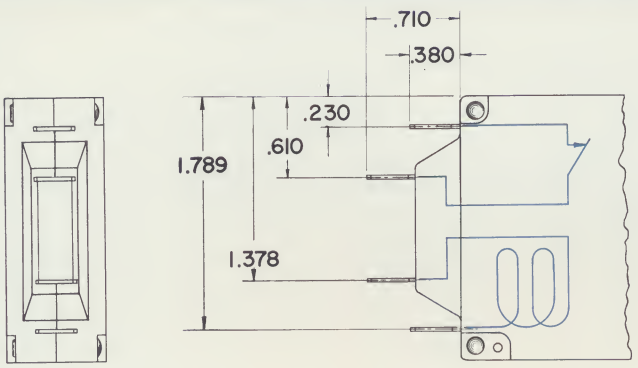
Adapter plate
Kit No. 009-18091

PANEL LAYOUT DIMENSIONS, INDIVIDUAL CUTOUTS

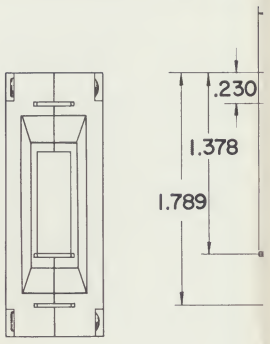


ALL DIMENSIONS ARE ±.005 EXCEPT AS NOTED

TERMINAL



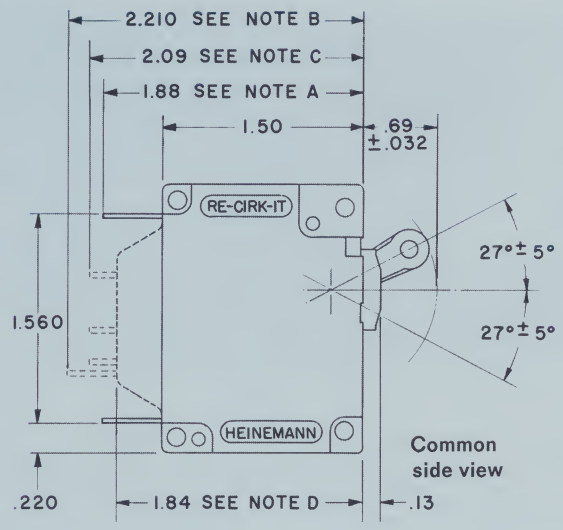
Relay-trip



Calibrating-tap

For all handle-to-terminal dimensio

ON DATA



Notes on breaker and terminal dimensions

A. Maximum depth of breakers with series-trip or switch-only construction. (Maximum case depth is 1.50″.) Line and load terminals are standard .250″, stationary, male push-on type. See page 11 for screw-type connector kit.

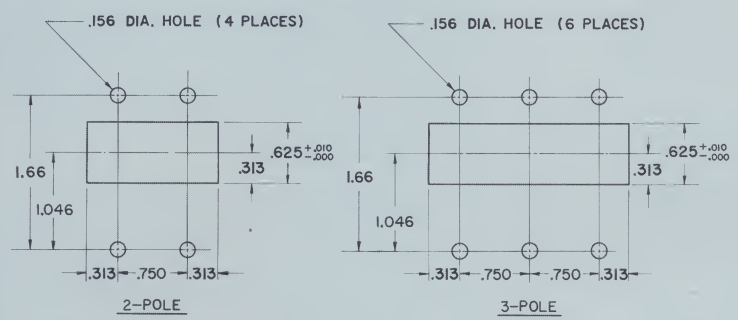
B. Maximum depth of breakers with calibrating-tap, shunt-trip, and relay-trip construction. All terminals as in Note A.

C. Maximum depth of breakers with auxiliary switch construction. Switch terminals are .093″, stationary, male push-on type. See page 11 for auxiliary switch connector kit. Line and load terminals as in Note A.

D. Extended back used only with breakers having special-function internal circuits to accommodate additional terminals.

All dimensions are in inches. Tolerance is ±.010″ unless otherwise specified.

PANEL LAYOUT DIMENSIONS, COMMON CUTOUT



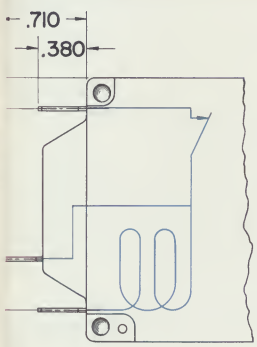
ALL DIMENSIONS ARE ±.005 EXCEPT AS NOTED

Notes on panel layout

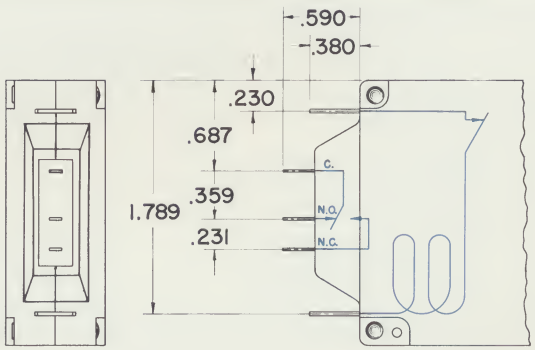
1. To accommodate a nameplate immediately above or below the breaker's handle, mount the breaker with two 6-32 flathead screws to preserve a flush surface over which the nameplate can be placed. Countersink the .156″ mounting screw holes with a 92° countersink to a .268″ diameter. Note: Panel thickness must be at least .062″.

2. Common cutout holes cannot be used for breakers with color caps. Use individual mounting holes as shown on page 12.

LOCATIONS



or shunt-trip

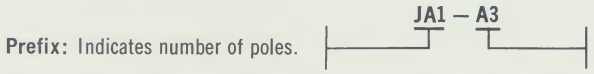


Series-trip with auxiliary switch

ıs, see common side view above.

HOW TO ORDER NON-STOCK BREAKERS

Non-stock breakers built to individual specifications can be ordered with a "custom" catalog number. Instructions begin here and are amplified in the examples below.



Suffixes are used to specify ampere rating and time-delay curve, except for multi-pole breakers that have a different construction for each pole. See examples below.

Single-Pole Breakers, or Multi-Pole Breakers, All Poles Identical

Examples	Basic Cat. No. Prefix	Body	Suffixes		
One Pole:	JA1	— A 3 —	5	—	2
Two Poles:	JA2	— B 2 —	15	—	3
Three Poles:	JA3	— C 4 —	1	—	P

Specify:

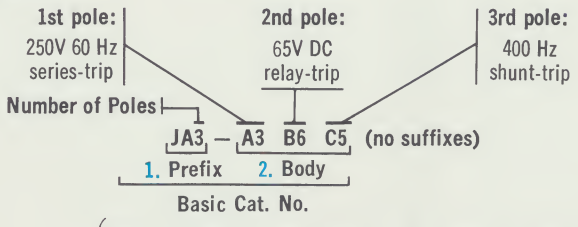
1. **Number of poles:** 1, 2, or 3.
2. **Voltage*:** See Table A for code letter. All circuit breakers are normally labeled with the maximum voltage as shown in Table A unless otherwise specified.
3. **Internal circuit construction:** See Table B for internal circuit code number.

Note: For multi-pole breakers with all poles identical, a single letter-number pair specifies the voltage and internal circuit for all poles.

4. **Ampere rating** breaker is to carry continuously. For breakers that are voltage- rather than current-rated, specify voltage value separately. Do not use a current suffix.
5. **Time-delay curve.** See pages 8 and 9 for curves. For non-time-delay construction, use Suffix P.

Multi-Pole Breakers, All Poles Not Identical

Example



3. **Pole 1:** 10 amps, Curve 3. **Pole 2:** Coil: 5 amps, 65V DC, Curve 3. Contacts: 10 amps, 250V 60 Hz. **Pole 3:** Voltage coil, intermittent duty, trips on 250V 400 Hz, Curve P.

Specify:

1. **Number of poles** in the prefix.
2. **Voltage* and internal circuit construction** in the body. Use a separate letter/number pair for each pole. See Tables A and B for codes. Poles are numbered from left to right as viewed from front of breaker. All breakers are normally labeled with the maximum voltage (Table A) unless otherwise specified.
3. **Ampere rating and time-delay curve** separately for each pole, not as suffixes. See pages 8 and 9 for time-delay curves. For non-time-delay construction, specify Curve P. For poles that are voltage- rather than current-rated, specify voltage value separately, as with Pole 3, above.

TABLE A

Code Letter	Maximum Voltages
A	250V 60 Hz (to 30 amps)
B	65V DC (to 20 amps) 50V DC (to 25 amps) 32V DC (to 30 amps)
C	250V 400 Hz (to 30 amps)

TABLE B

Code Number	Internal Circuit Construction	Code Number	Internal Circuit Construction
0	Switch only, no coil	4	Calibrating-tap
2	Series-trip with SPDT auxiliary switch	5	Shunt-trip
3	Series-trip	6	Relay-trip†

†Specify coil and contact voltage and current ratings separately.

***NOTES**

1. UL-listed models are labeled with the UL-listed voltage (page 10). The catalog number on the breaker label will contain a special Suffix A indicating UL listing.
2. If voltage is rectifier-produced DC, furnish separately: (a) Full- or half-wave rectification, (b) Number of phases, (c) Filtered or unfiltered. If filtered, give ripple factor or percent filter factor.
3. Breakers for DC service should be installed with the positive (plus) lead connected to the line terminal.

ACCESSORIES

Color Caps: For multi-pole breakers, order one cap per pole.

Color	Catalog No.	Color	Catalog No.
Black	121-76002	Green	121-76006
Brown	121-76012	Blue	121-76007
Red	121-76005	Gray	121-76004
Orange	121-76013	White	121-76008
Yellow	121-76009		

Adapter plate, Kit No. 009-18091: Adapts single-pole models to panels punched for Heinemann AM12 breakers. For multi-pole breakers, order one kit per pole. Plate fastens to panel with two customer-supplied 6-32 screws. For dimension drawing, see page 13.

Black Handles: Black handles (and handle ties for multi-pole breakers) can be furnished if preferred to standard white handles. Specify separately.

Screw-type connectors, Kit No. 009-18056: Contains two quick-on connectors that adapt breaker's coil and contact terminals to screw-type connections. Note: Customer-supplied, crimp-on connectors such as ARK-LES Quick-Connect Female #3000H9AB, or AMP Faston Female #41202, or equivalent may be used. See page 5 for photo, page 13 for terminal dimensions.

Auxiliary switch connectors, Kit No. 009-18120: Contains three solderless connectors that fit smaller switch terminals. See page 13 for terminal dimensions.

Protective Shield, Cat. No. 006-10147: Tough, transparent silicone rubber boot seals panel opening around breaker handle against environmental contamination without hindering operation. One-pole models only. Note: Boots and color caps can be used together. Request Bulletin 500.

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